

# Modern Concepts of Cardiovascular Disease

Published monthly by the AMERICAN HEART ASSOCIATION

1775 BROADWAY, NEW YORK 19, N. Y.

## Editor

BENEDICT F. MASSELL, M.D., Boston

## Associate Editor

GORDON S. MYERS, M.D., Boston

## Advisory Committee

EMMETT B. BAY, M.D., Chicago

HAROLD FEIL, M.D., Cleveland

GEORGE E. BURCH, M.D., New Orleans

CHARLES A. NOBLE, JR., M.D., San Francisco

VOL. XXI

AUGUST, 1952

No. 8

## THE TREATMENT OF PERIPHERAL ARTERIOSCLEROSIS\*

### BASIC CONCEPTS

Atherosclerosis is the important form of arteriosclerosis. It occurs in early middle age as frequently as in senility. The role of dietary cholesterol in its pathogenesis is uncertain.

The development of the atheroma is accompanied by slowly progressive effects. Acute symptoms are usually caused by supervening thrombosis.

The disease is focal, not generalized. In some instances branch arteries may be obstructed with resulting ischemia in circumscribed areas of muscle, skin, or nerve out of proportion to the degree of disease of the main trunk. In each area involved the smaller arteries and arterioles are usually unaffected and, therefore, constitute collateral pathways.

Even in old age the collaterals are capable of great dilatation after sympathectomy. Only occasionally is such dilatation impossible because red cell agglutination or ordinary thrombosis in the fine vessels have been induced. Vasospasm is uncommon, and the dilatation occurs slowly through paralysis (palsy) of the small arteries which were previously in normal tone. The skin with an excellent anatomic network of collaterals is capable of greater increase in vascularity than the muscles, whose vessels possess but limited anastomotic connections.

Most limbs continue well indefinitely after successful dilatation of the collaterals; nevertheless, some symptoms may remain because of the limitation of flow through fine channels compared to that through normal major arteries. In rare instances, further occlusion of the major arteries may take place.

The prognosis for life after initial manifestations of peripheral arterial disease varies greatly. The life span of many patients seems but little affected.

### TREATMENT OF CHRONIC MANIFESTATIONS

Even trivial injury may precipitate gangrene. The patient should wash his feet daily, applying lanolin to dry parts, wear soft thick socks and

well-fitting shoes, have a good chiropodist care for his nails, apply none but the blandest chemicals to his feet, and avoid contusions, freezing, or scalding. Gangrene has been produced by physicians through incisions below the knee, avulsion of a nail, application of tight casts, forceful manipulation, the use of diathermy, or the application of adhesive tape or various chemicals. Dermatophytosis allows the entry of bacteria and should be treated by mild substances such as Desenex®.

Although various drugs are widely used, the writer has found them disappointing. Alcoholic beverages should not be prescribed for a patient not already using them, for they are of doubtful benefit and may lead to addiction. Tobacco in moderation, e.g. 6 cigarettes a day, seems harmless.

Buerger's exercise is of questionable benefit except in acute ischemia, where it tends to prevent stasis; even here recent work indicates it may diminish blood flow. Most workers feel that other forms of physiotherapy are hardly worthwhile.

Surgical restoration of the lumen of the large arteries is now being tried in some clinics, but it is not ready for wide application.

Lumbar sympathectomy has proven an effective and safe method of increasing collateral blood flow in the arteriosclerotic extremities. Improvement may be immediate or may require several weeks, but it is then apparently permanent except in the rare instances of further major artery occlusion. The greatest increase in vascularity is in the skin, the tissue most to be protected if gangrene is to be avoided. The operation offers considerable impetus to healing of superficial ulcerations and quite effective insurance against future necrosis. Claudication is substantially improved in 75 per cent of the cases.

No correlation exists between the results and the age of the patient, previous coronary or cerebral artery involvement, the level of the blood pressure when essential hypertension is absent, the level of a palpable pulse when above the foot, or the degree of calcification of the arteries. Local conditions not appreciably altered by the

\*From the Surgical Service of the Peter Bent Brigham Hospital

operation are listed under contraindications below. The local results are generally not so good in diabetes, and the incidence of post-operative morbidity is also higher in the presence of this disease. Good results almost invariably follow if a pre-operative test showed an increase in foot temperature after anesthesia, but good results often also occur when the temperature failed to rise.

The operation is indicated in (1) young patients, whether their problem is claudication or threatened necrosis, because the disease has more opportunity to progress in their long life span; (2) old patients, if their circulatory status is deteriorating rapidly or if gangrene is imminent, provided the ischemia appears reversible; (3) diabetic patients, because of the greater susceptibility of these patients and in spite of the disadvantages noted above; (4) patients who have lost one limb because of arteriosclerosis; (5) patients with cutaneous necrosis; and (6) patients with arterial thrombosis. Sympathectomy is contraindicated if the patient appears too weak to withstand the operation or if the following conditions exist in the limb: (1) deep necrosis extending to bone proximal to the toes; (2) very extensive cutaneous necrosis; (3) signs of deep infection; (4) signs of extensive agglutinative thrombosis in the cutaneous vessels of the toes or foot; and (5) rigor of the muscles.

Dangers of sympathectomy include operative mortality (an incidence of 2 per cent in our series) and worsening of the vascular status of the limb with consequent gangrene (2 per cent of our patients). An unfavorable outcome after operation may be due to: (1) the existence of one of the contraindicating local factors mentioned; (2) a technically imperfect operation; (3) advancing infection; (4) venous or arterial thrombosis in the affected limb; and (5) post-operative slowing of the local blood stream with or without agglutinative thrombosis of small vessels. Factors in this last mechanism are recumbency, a post-operative general fall in blood pressure, the vasoconstriction of shock and of certain drugs, operative handling of the sympathetic chain, sensitization of the vessels in the first week or two after sympathectomy, and the fortuitous existence of residual sympathetic pathways.

Measures found useful in diminishing these effects are: (1) the avoidance of a fall in blood pressure during operation, using intratracheal rather than spinal anesthesia for very sick patients; (2) early post-operative elevation of the head of the bed and early activity; (3) adequate chemotherapy when infection is present; and (4) the routine use of heparin, starting several hours after operation.

#### TREATMENT OF THE ACUTELY ISCHEMIC LIMB

Treatment will not differ greatly whether the

acute state is reached by progressive chronic deterioration or through thrombosis except that in the latter case heparinization is necessary. The head of the bed should be elevated with the patient's foot placed on a soft rubber pad. No heat should be applied because it raises metabolic needs. Sympathectomy is useful, but, since it may occasionally cause a temporary worsening, it should be held in abeyance when the ischemia is extreme and when the conditions mentioned as contraindications are present. If some spontaneous improvement occurs, the operation may be performed.

#### TREATMENT OF INFECTION AND GANGRENE

Active infection demands rest in bed. Penicillin may be given in doses of 200,000 units every 8 hours unless it is determined by culture that another antibiotic is appropriate. A decision to do a sympathectomy should be reached only after the infection is controlled. Deep pus must be drained. In the foot such drainage is often accomplished by open amputation of a gangrenous toe plus a more proximal incision. If infection remains uncontrolled, amputation must be done. When the vascular status might otherwise allow an amputation below the knee, a preliminary low open "guillotine" may precede the definitive procedure.

Small areas of necrosis, not involving bone or muscle, may heal spontaneously or after sympathectomy. Dressings should be non-greasy, bland, and non-allergenic. Best are wet dressings of isotonic saline, saturated boric acid, or, if pyocyanus is present, 0.5 per cent acetic acid. When the area is fairly clean, "pinch" skin grafts may be successful. Cutaneous infarctions, if more than 1 to 2 cm. in diameter, should be excised, the area grafted with split skin, and sympathectomy performed—all in one sitting.

Gangrene demands amputation. Sympathectomy has failed to lower the level at which amputation may be done with successful healing, but it is occasionally helpful after amputation in healing or preventing small areas of necrosis. There is a substantial possibility of failure in amputations done below the supracondylar thigh level. Nevertheless, a toe or transmetatarsal operation should be tried if necrosis and infection lie distal to the line of operation and if the vascular status of the foot is stabilized. Mid-leg amputations are followed by greater success in the use of a prosthesis than are those at thigh level, and they deserve a wider trial. In all but the transmetatarsal procedure, a circular incision should be used. Post-operatively antibiotics should be used routinely, and heparin should be given if a thrombus is found in the veins at the level of section.

Edward A. Edwards, M.D.  
Boston, Massachusetts

